



## BIOMEDICAL WASTE MANAGEMENT TRAINING: AN EFFICIENT TOOL?

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### ABSTRACT

**Introduction:** This is an interventional study since an in-service training to nursing staff has been given, performed in order to assess whether training has a significant impact on knowledge on BMW. BMW has become a significant concern for both the medical and general community. Effective management of biomedical waste is not only a legal necessity but also a social responsibility. **Objective:** To assess the impact of in-service training on the knowledge among the nursing staff working in pre-identified patient care areas of a tertiary healthcare organization in North India. **Methods:** The study was conducted from April 2017 to April 2018. It was an interventional study. Study sample consists of the Nursing staff working in the Pre identified patient care areas of the institute who are dealing with BMW generation. The study was conducted by using a questionnaire. The data thus obtained was tabulated and interpretation was done by using SPSS 23 software. **Results:** It included 200 Nursing staff. Majority of study participants belongs to 21 -30 years (61%) age group. More than two third of study participants working in hospital from 1 to 5 years. The result indicated that there was a significant increment in the knowledge score from the pre-assessment to the post-assessment. The mean difference between two was found to be significant ( $2.3 \pm 0.41$  v/s  $2.80 \pm 0.39$ , P value  $< 0.001$ ). **Conclusion:** the use of a training model could improve knowledge of regulated biomedical waste management among the staff. Such an improvement could translate into improved performance. The importance of training regarding biomedical waste management cannot be overemphasized, lack of proper and complete knowledge about biomedical waste management impacts practices of appropriate waste disposal.

**KEYWORDS :** Biomedical Waste, Nursing Staff, knowledge, BMW Rules 2016

### INTRODUCTION

There are few things certain in life – first is death, second is change and last is waste. No one can stop these things to take place in our lives. But with better management, we can prepare ourselves for them. Every health care worker activity generates waste while delivering health care.<sup>1</sup>

Biomedical waste is the waste generated from medical procedures within healthcare facilities. It includes human and animal anatomical wastes and treatment apparatus that are used and generated during diagnosis, treatment or immunization in hospitals, nursing homes, pathological laboratories (WHO, 2014).<sup>1</sup>

According to Bio-Medical Waste management rules, 2016, Bio-Medical Waste (BMW) means any solid, fluid, or liquid waste including its containers and any intermediate product which is generated during the diagnosis, treatment, or immunization of human beings or animals or in research activities pertaining thereto or in the production or testing of biological and includes four categories for same.<sup>2</sup>

The World Health Organization states that 85% of hospital wastes are actually nonhazardous, whereas 10% are infectious and 5% are noninfectious but they are all included in hazardous wastes. About 15-35% of hospital waste is regulated as infectious waste. This range depends on the total amount of waste generated.<sup>3</sup>

Biomedical waste collection and proper disposal have become a significant concern for both the medical and general community.<sup>4</sup> Among all health problems, there is a particular concern with HIV/AIDS, Hepatitis B, and C, for which there is strong evidence of transmission through healthcare waste. The BMW rule applies to all those who generate, collect, receive, store, transport, treat, dispose or handle BMW in any manner and also to every institution that generates BMW. The biomedical waste should be segregated at source into color-coded bags or containers and its collection and proper disposal should be a significant concern for both medical personnel and general community.<sup>4</sup> although the risk posed by the BMW can never be totally eradicated it can be significantly reduced by educating training. An effective programme of hospital waste management can have distinct benefits such as cost-saving linked to waste reduction.<sup>5</sup>

The waste produced in the course of healthcare activities carries a higher potential for infection and injury than any other type of waste. Inadequate and inappropriate knowledge of handling of healthcare waste may have serious health consequences and a significant impact on the environment as well. However, lack of awareness has led to the hospitals becoming a hub of spreading disease rather than working toward eradicating them. The data available from developed countries studies indicate that approximately 1-5 kg of waste is generated per bed per day, with substantial inter-country and inter-specialty differences. The data available from developing countries also indicate that the range is essentially similar but the figures are on a lower side with 1-2 kg per day per bed.<sup>6</sup> In India, it is estimated to be 2.0 kg per bed per day.<sup>7</sup> On an average 11.5 Ton/day Municipal Solid waste is being generated in Patient Care Area and Residential Area of the institute, SGPGIMS, Lucknow.

Effective management of biomedical waste is not only a legal necessity but also a social responsibility. Hence, there is a need for resource material to help administrators, doctors, nurses, and paramedical staffs. The purpose of BMW is mainly to reduce waste generation, to ensure its efficient collection, handling, as well as safe disposal in such a way that it controls infection and improves safety for employees working in the system. For this, a conscious, coordinated and cooperative effort has to be made from doctors to housekeeping staff. The present study was conducted with the aim to assess the knowledge of nursing staff working in a pre-identified patient care areas of institute pre and post interventions.

### MATERIAL AND METHODS

The study was conducted at SGPGIMS. The institute is a tertiary care center serving not only the Lucknow city and district but also the other part of Uttar Pradesh of near states. It was an interventional study. All the patient care areas of hospital generate biomedical waste but keeping in view the constraints of time, the few areas were identified. The area includes Medical Wards, Surgical Wards, Operation Theatre (OT), Intensive Care Unit (ICU) and Laboratory Area which fairly represents the spectrum of various therapeutic areas. Study participants included the nursing staff working in the pre-identified areas of the institute who are dealing with BMW. All the staff was invited individually to participate in the study after giving informed consent. All the study participants were assured about their

confidentiality and anonymity. The study was conducted by using a pretested, structured Questionnaire; it was validated by the respected faculty of Hospital administration. The questionnaire included 10 questions to assess Knowledge about biomedical waste management.

The assessment tool was consist of two sections

Section-A: It consists of a socio-demographic profile of staff.

Section-B: It consists of questions on biomedical waste management to assess knowledge.

Current status of Knowledge of Nursing Biomedical waste Treatment Staff was ascertained through Questionnaire in pre-identified areas. **Pre and Post Training Knowledge** 10 days prior to and after the Training, Questionnaires was distributed to the study sample in pre-identified areas to know the Knowledge.

In order to minimize the impact of shifts of duty on the outcome of the study, an appropriate tool was distributed during each duty shifts, uniformly

The following interventions were implemented:

**a) Longitudinal Training**

In order to train the Nursing staff, a *Longitudinal In-service Training Program* (LTP) was conducted for the duration of 6 months which was commenced from April 2017 to August 2017 to help them to adopt BMWM Rules, 2016.

**b) On-site Training – Segregation of Biomedical Waste:**

Biomedical Waste Management (BMWM) Squad was constituted for onsite training.

BMWM Squad observed SAS practices and the staff was trained on site in all pre-identified areas. Augmentation of processing by Special Re-training session as wherever necessary as evaluated in post-training assessment. A total of 200 nursing staff was trained during the intervention phase of the study. The data was tabulated and interpretation was done by using percentages through SPSS 23 software.

**RESULTS AND OBSERVATIONS**

The study sample included persons falling under the age range of 18-60 years. 200 nursing staff participated in the present study. Majority of the study sample belongs to 30-44 years (44%) age group. More than two thirds in the study sample, Nursing staff was working in the hospital for more than 1 to 5 years. (Table 01)

**Table01: Demographics of Nursing Staff**

Characteristics	Number (n=200)	Percentage
Age		
18-29 years	54	27 %
30-44 years	88	44 %
45-59 years	57	28.5%
> 60 years	01	0.5 %
Sex		
Male	40	20 %
Female	160	80%
Working in hospitals since		
< 1 year	1	0.35%
1-5 years	191	67.73%
6-10 years	52	18.43%
> 10 years	38	13.47%

**Table 02: Awareness about Bio-Medical Waste (BMW) and its management among nursing staff**

SL. NO.	QUESTION	PRE – INTERVENTION		POSTINTERVENTION		RESULT
		CORRECT RESPONSE IN (%)	INCORRECT RESPONSE IN (%)	CORRECT RESPONSE IN (%)	INCORRECT RESPONSE IN (%)	
1.	Do You think it is important to know about biomedical waste segregation, collection, disposal, hazards, and legislation?	42	58	71	29	29
2.	The used urine sample container is a type of biomedical waste?	51	49	75	25	24
3.	How many different categories of BMW are there in schedule 1 of BMWM Rules, 2016?	20.5	79.5	61	39	40.5
4.	According to the Biomedical Waste Management Rules, 2016 waste should not be stored beyond:	13.5	86.5	62	38	49
5.	Who regulates the safe transport of biomedical waste in your state?	40	60	62	38	23
6.	Do we need a separate permit to transport biomedical waste?	73.5	26.5	73.5	26.5	0
7.	Sharp Biomedical waste like scalpels, needle, glass ampoules, test tubes, and glass slides should be disposed off in.	36	64	72	28	36
8.	What is the correct method for disposal of biomedical wastes contained in the yellow colored bag?	26	74	63.5	37	38
9.	The real place of segregation is	32	68	52	48.2	20
10	The key process deactivation of biomedical waste contained in a red colored bag is	24	76	49.0	51	25

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A pre-interventional study revealed that only 42 % of the staff had some knowledge about BMW generation and legislation. The interventions put in by the investigator raised this level of knowledge regarding BMW generation & legislation to 71 %. After intervention the knowledge about the type of waste went up to 75%, this was just 51% pre-intervention. A change of 24 % was seen among these nursing staff.

It was alarming to note that only 20.5% of the respondent was aware of the categories of BMW which are in schedule 1 of BMWM Rules, 2016, but the interventions taken helped this figure to reach up to 61 % of the population. A difference of 40.5 % could be deduced from the data gathered.

Despite being well qualified in this field, not many of the nursing staff was aware of segregation of different categories of BMW prescribed in Schedule I of BMWM Rules, 2016. Only 36 % of the nursing staff had some knowledge about various disposal practices of BMW. The training laid special emphasis on these categories, which helped in bridging this gap by almost 36 %, as post-training 72 % of the nursing staff thoroughly knew about the categories of BMW. When asked which of the options given in the questionnaire would best describe BMW, around 52 % of nursing staff gave the right answer while the rest had poor knowledge regarding BMW. The post-training assessment showed a rise in this level to 80 %.

The Bio-Medical Waste Management Rule, 2016 states that the healthcare waste should not be stored beyond 48 hours but it was observed that this was not being followed in the pre-identified areas. The training helped in overcoming this gap in knowledge and current practice by 59 % .until now the regulation & transportation of BMW was not a concern for HCP's since it was not a part of their job profile. 73.5 % of them were not aware that a separate permit was required to transport the Biomedical Waste from any Hospital. The interventional training helped them in realizing the importance of safe transportation of BMW.

**Table 03: Nursing Staff overall comparative mean score**

Parameters	Intervention	Mean	n=200	% Mean	Mean % Change	p-value
Knowledge	Pre	2.3	200	45.80	25	<0.001
	Post	2.8	200	70		

The result indicated that there was a significant increment in the knowledge score from the pre-assessment to the post-assessment. The mean difference between two was found to be significant (2.3+/- 0.41 v/s 2.80+/-0.39, P value <0.001)

### Discussion

The concern regarding the biomedical waste is mainly due to the presence of high concentrations of pathogenic organisms and organic substances in BMW. The substantial number of organisms of human origin in BMW suggests the presence of virulent strains of viruses and pathogenic bacteria in undetected numbers.<sup>8</sup> Therefore, improper Knowledge of BMW in the hospital may increase the airborne pathogenic bacteria, which could adversely affect the hospital environment and community at large.<sup>9</sup> Improper Waste Management has a serious impact on our environment. Apart from the risk of water, air & soil pollution, it has a considerable impact on human health due to pathogenic effects.<sup>10,11</sup>

The present study was conducted on Nursing Staff in pre-identified patient care area. The study showed that the pre-intervention knowledge of Nursing Staff on Biomedical waste management was not adequate (45 Mean Percent score P<0.001), which was improved significantly after the implementation of interventions, i.e., LTP( Longitudinal in-service Training Programs), Onsite training, BMWM squad visit to pre-identified areas, daily monitoring by the investigator of the study. This finding was similar as reported in previous studies.<sup>12,13</sup> <sup>14, 15</sup> this low standard of knowledge regarding BMW management among staff may be due to the lack of any formal training to them. Kapoor et al in their systematic review from dental teaching institutions in our country concluded that the level of knowledge in study population regarding BMW was low and continuous training programmes were needed to enhance it.<sup>16</sup>

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Improper segregation practices not only increases the risk of infection to the public but also indirectly increases the load on the organization, which is like a double edge sword. The mixing of general and biomedical waste results in the conversion of 80 % general waste into 100% BMW. As hospitals have only 2 incinerators, for terminal disposal of waste, incineration is considered to be a relatively poor technology in terms of environmental safety and long term cost.<sup>17</sup> Which makes it essential that more focus should be laid on proper segregation of waste so that waste which is not meant for incineration, like plastic material etc., could be prevented from mixing into the waste stream meant for incineration.

The study revealed that all Nursing Staff had better scores after the intervention than the pre-intervention. According to the findings, the Knowledge levels of all Nursing Staff have improved after the interventions, which indicated the effectiveness of the training supplied to the study sample. The amount of waste produced in hospitals increases day by day in proportion to the services provided. To eliminate the danger posed by this growing amount, to human and environment health, all healthcare personnel should be supplied with "Hospital Medical Waste Plan" and regularly given training on where each type of waste should be deposited.<sup>18</sup>

Knowledge regarding BMWM in Nursing, who is one of the stakeholders for BMWM, highlights the importance of this study and need of the hour for early sensitization for BMWM among them. As, the present Nursing Staff are the persons who come in direct contact of BMW, early sensitization and repeated revision of this important topic for them will be useful in improving the awareness of biomedical waste management. And in the future, it will prove beneficial for society at large.

The results of our study are consistent with the conclusions of multiple numbers of research papers delving into the information level on the medical waste of health workers.<sup>18,19,20,21</sup>

### CONCLUSION

The results of this study suggest that the use of a training model could improve knowledge and attitudes in regulated medical waste management personnel. Such an improvement could translate into improved performance. The importance of training regarding biomedical waste management cannot be overemphasized, lack of proper and complete knowledge about biomedical waste management impacts practices of appropriate waste disposal. Therefore, it is proposed that the health policy makers and hospital authorities must replicate this knowledge translation program in other hospitals of the country to manage the big menace caused by ineffective and unprotected infectious waste handling.

Since this is the first interventional study of its kind in SGPGIMS, Lucknow, more research will be needed to devise an improvised policy of waste management practices and its quality control system.

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